

RESEARCH DEPARTMENT

**TRANSMITTING AERIALS FOR THE GRANTOWN V.H.F. TELEVISION
AND V.H.F. SOUND STATION**

Technological Report No. E-114/3

(1965/13)

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for Head of Research Department

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INTRODUCTION

The Grantown relay station came into operation on 8th February 1965. It provides a television and v.h.f. sound service to Grantown, Nethy Bridge, Boat of Garten, Carrbridge and Duthil; parts of Aviemore are also served.

SUMMARY OF INSTALLATION

- Site: The site is at Laggan Hill, 1.75 miles (2.8 km) west-south-west of Grantown, grid reference NJ 003 267, height 1,295 ft (394 m) a.m.s.l.
- Support Structure: The support structure consists of a 110 ft (33.6 m) square-section self-supporting tower oriented with one side on a bearing of 45° ETN. The tower is parallel-sided from the 63 ft (19.2 m) to 110 ft (33.6 m) levels and over this section is screened on all sides by horizontal 1 in. (25.4 mm) diameter rods spaced 9 in. (230 mm) apart. A separate tower, 60 ft (18.3 m) in height and spaced 120 ft (36.6 m) on a bearing of 315° ETN from the transmitting aerial tower, is used to support the receiving aerials.
- General Arrangement: See Fig. 1.
- Band I
- Channel: Channel 1 with horizontal polarization is used. The vision carrier is offset +47.25 kc/s and the sound carrier +34.0 kc/s.
- Aerial: The aerial¹ consists of four tiers each of a single, cranked, horizontal $\lambda/2$ dipole mounted on a bearing of 225° ETN and spaced 8 ft 6 in. (2.6 m) from the axis of the 3 ft (0.92 m) square tower section. The spacing between tiers 1 and 2 is 0.5λ , between tiers 2 and 3 0.68λ and between tiers 3 and 4 0.5λ . The mean height of the aerial is 84 ft (25.6 m). There are independent main feeders to each two-tier half-aerial.

Power: A single 100 W translator-amplifier is used.

Templet and horizontal radiation pattern (h.r.p.): See Fig. 2 and Note 1.

Vertical radiation pattern (v.r.p.): See Note 2.

Gain:	Mean intrinsic gain	3.8 dB
	<u>Deduct:</u> losses due to possible misalignment and distribution feeders	<u>0.2 dB</u>
	Mean net gain	3.6 dB
	<u>Deduct:</u> loss in main feeder (type RPC 2603)	1.0 dB
	network loss	<u>0.6 dB</u> <u>1.6 dB</u>
	Mean effective gain	<u><u>2.0 dB</u></u>

Band II

Carrier Frequencies: 89.8 (Light), 92.0 (Third), 94.2 (Scottish Home) Mc/s.

Aerial: The aerial¹ has two tiers each consisting of a dipole plus $\lambda/4$ -spaced parasitic reflector oriented to give maximum radiation on a bearing of 221° ETN. The dipole and reflector limbs are cranked (as shown in Fig. 1) to provide an included angle of 160° . The dipole/reflector units are mounted so that the direction of maximum radiation is approximately parallel to the adjacent face of the tower. The inter-tier spacing is 1.26λ and the mean height is 30 ft (9.2 m) a.g.l. There are independent main feeders to each tier.

Power: A nominal 100 W translator-amplifier over-run to give an output of 125 W is used for each programme.

Templet and h.r.p.: See Fig. 3 and Note 3.

V.R.P.: See Note 2.

Gain:	Mean intrinsic gain	0.2 dB
	<u>Deduct:</u> losses due to possible misalignment	<u>0.2 dB</u>
	Mean net gain	0.0 dB
	<u>Deduct:</u> loss in main feeder (type RPC 2603)	0.7 dB
	network loss	<u>0.9 dB</u> <u>1.6 dB</u>
	Mean effective gain	<u><u>-1.6 dB</u></u>

Programme Links:

The television programme is obtained by direct reception of the Channel 2 (horizontal polarization) transmissions from Rosemarkie. Protection against precipitation-static interference is given by the use of a shrouded receiving aerial in conjunction with a corona-protection spike and parasitic reflectors which surmount the support tower. The v.h.f. sound programmes are obtained by direct reception of the transmissions from Meldrum.

Notes:

1. A cranked dipole is used to increase the field radiated in the minima of the h.r.p. The final design and an accurate h.r.p. of the aerial were determined from measurements on a small-scale model.
2. Height-gain reception tests were carried out during the site survey for this station using a single horizontal dipole for the transmitting aerial. These showed that the field strength in the service area was critically dependent on the height of the aerial due to reflexions from sloping ground in its vicinity. To minimize this undesirable effect the spacing of the tiers of the service aerial is such that a minimum in the v.r.p. occurs at an angle from the horizontal equal to about twice the angle of the average ground slope.
3. The preliminary aerial design was based on a theoretical prediction of the h.r.p. in which re-radiation from the support tower was neglected. A closer approximation to the h.r.p. (shown in Fig. 3) was obtained from measurements on a small-scale model using a sheet-metal model of the tower. An exact h.r.p. could have been obtained from a model in which the details of the lattice construction were faithfully reproduced. This was not however considered justified since the effect of the tower, even if fully-screened, was found to be relatively small.

REFERENCE

1. Detailed information on the construction and dimensions of the aerials is given on the following drawings held by BBC Planning and Installation Department.

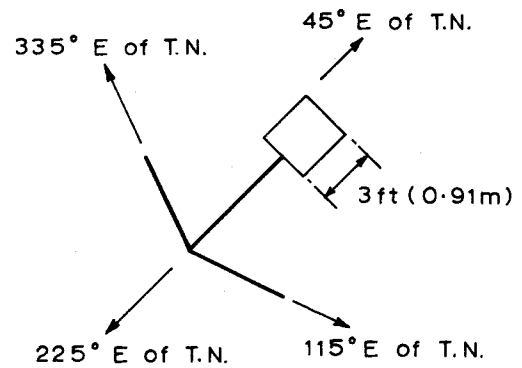
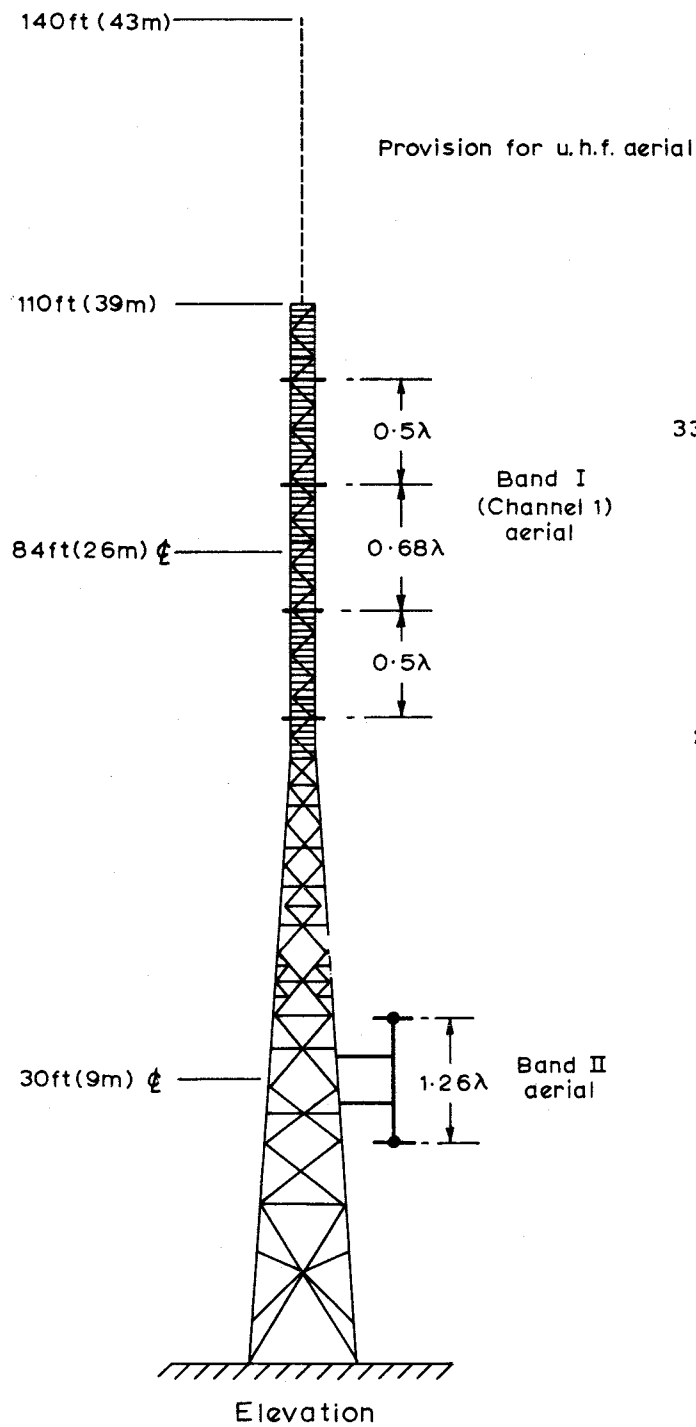
P.I.D. 9011.2.3J Band I Dipole Assembly

P.I.D. 9011.2.4J Band II Dipole Assembly

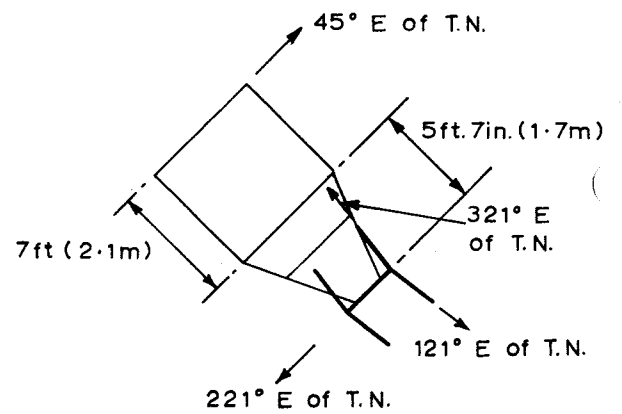
P.I.D. 9011.2.5J Band I Aerial Assembly on Tower

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P.I.D. 9011.2.6J Band II Aerial Assembly on Tower



Plan of Band I transmitting aerial



Plan of Band II transmitting aerial

Fig. 1. General arrangement of aerials on tower.

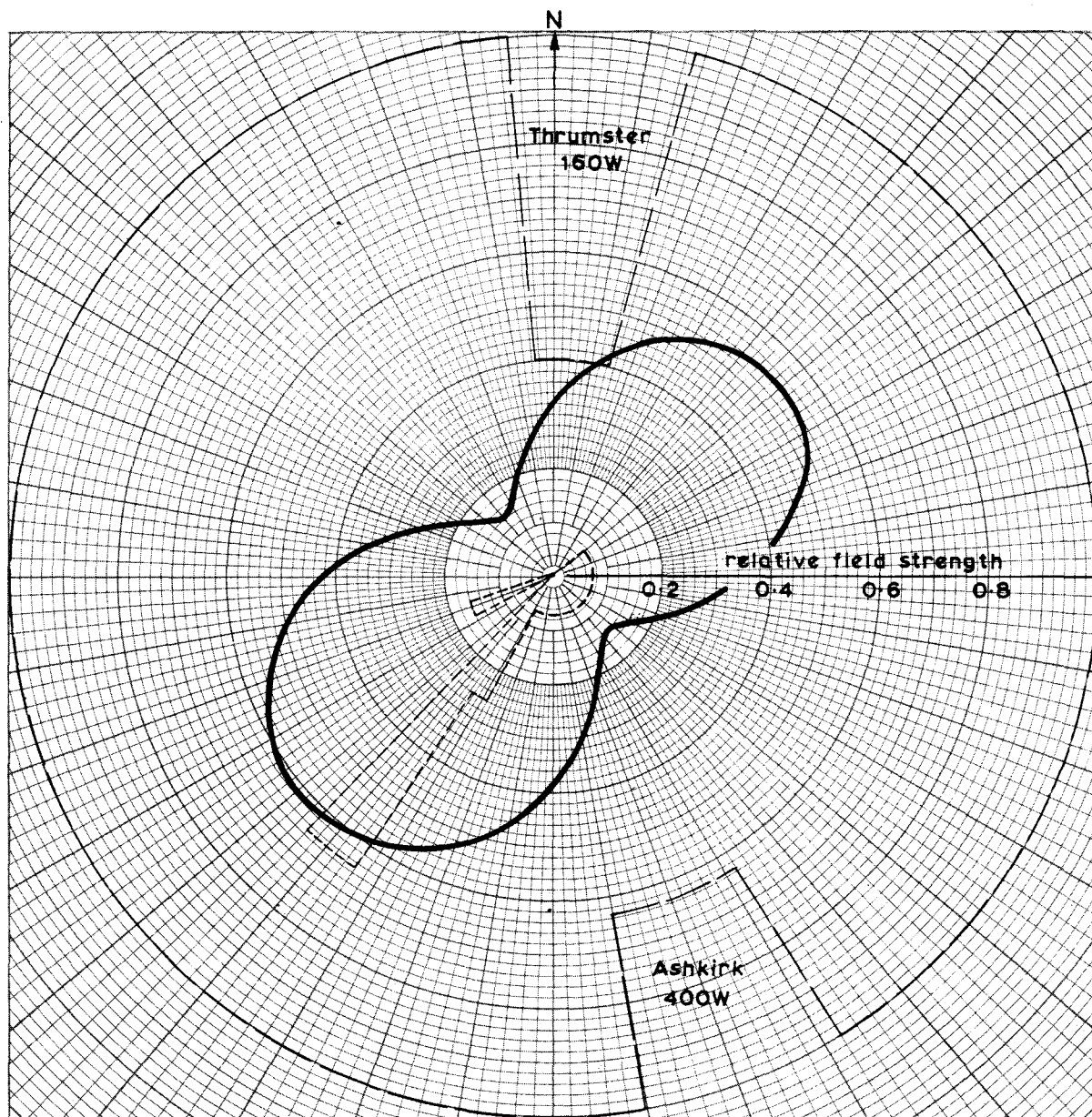


Fig. 2. Band I templet and horizontal radiation pattern

HORIZONTAL POLARIZATION

Channel 1 (Vision carrier 45.0 Mc/s, Sound carrier 41.5 Mc/s)

Mean effective gain 2.0 dB

————— Maximum permissible E.R.P.

Transmitter power 100W

----- Minimum desirable E.R.P.

Mean E.R.P. 158W

Unit field corresponds to an E.R.P. of 1kW

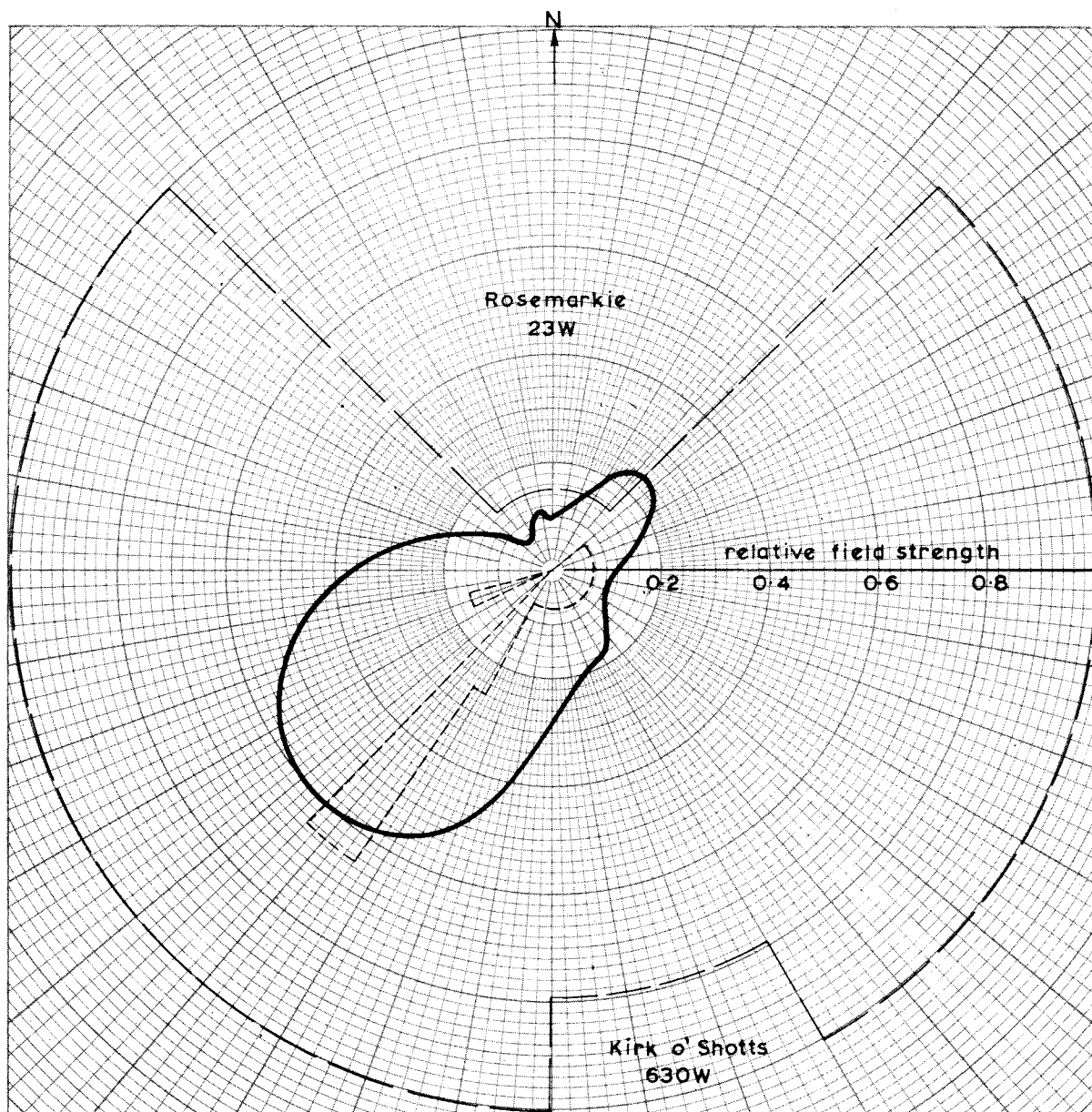


Fig. 3. Band II templet and horizontal radiation pattern

HORIZONTAL POLARIZATION

89.8 (Light), 92.0 (Third), 94.2 (Scottish Home), Mc/s

Mean effective gain -1.6dB

Transmitter power 125W

Mean E.R.P. 87W

————— Maximum permissible E.R.P.

----- Minimum desirable E.R.P.

Unit field corresponds to an E.R.P. of 1kW